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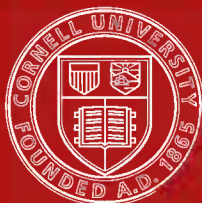
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THE WILLOW FAMILY

OF THE

GREAT PLATEAU



BY
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INTRODUCTORY.

This work, on the western willows, is put forth tentatively in order to clear up some doubts and to direct the attention of field botanists to the willows which heretofore have been difficult to identify because of not being described in compact shape, for the descriptions have been so scattered and so contradictory as to be very confusing.

It is evident that the stipules as a rule are of little value for identification.

The color of the twigs and leaves in herbarium specimens is valueless. Many willows are said to dry black, but they do so only when neglected in the press, some drying black earlier than others only.

The color of the twigs is lighter in summer than in spring as a rule. Shade and sunshine also make differences in the same species. The male and female twigs often differ from each other and this has led to much poor identification. It is very desirable to get the colors of the twigs of both sexes of each species in various situations of exposure and altitude.

It is very desirable to get the changes of color in the scales of the male and female catkins; to determine if the sex color differs permanently in the scales of each species, and what variation there is in each species. It is very desirable that where possible willows should be tagged when the flowers are gathered so that mature leaves can be gathered later from the same place, since the flowering leaves often differ from those that come out later.

Life Zones.

The life zones as used in this paper were given in my Contributions and my Geography of Utah. They are as follows: **Frigid**, corresponding to the Arctic and treeless regions above timber line on the mountains; **Upper Temperate**, corresponding to the range of the spruce and fir, aspen for the most part, and practically all of the region above the range of *Artemisia tridentata*, and *Quercus Gambelii* and the burr oak; **Middle Temperate**, corresponding to the range of the deciduous oaks, and whose upper limit is the upper limit of *Artemisia tridentata* and the beginning of the trees given above; **Lower Temperate**, corresponding to the range of the pinon and desert juniper, and live oaks of Arizona, and whose upper limit is about that of the apricot and peach though a little lower, and whose lower limit is that of *Artemisia tridentata*, and the beginning of *Larrea*; **Tropical**, corresponding to the range of *Larrea*, *Pluchea*, *Chilopsis*, *Martynia*, etc. For those who use the terminology of Merriam it should be said that the classification given here much antedates his, having been given by Humboldt many years ago in general, the subdivisions are my own. Merriam's "Sonoran" is my Tropical, his "Upper Sonoran" is my Lower Temperate, and has no relation to the Sonoran botanically as there is a greater break in the flora between the Tropical and Lower Temperate than in any other zone. Merriam's "Transition" is my Middle Temperate, and there is less transition in it than in the next zone above it, his is an inappropriate name. The rest is his "Boreal." This is also an inappropriate name, applying only to the northern Upper Temperate Life Zone instead of to both northern and southern as mine does.

The Willow Family of the Great Plateau.

WILLOW FAMILY.

SALICACEAE.

Lindley Nat. Syst. Ed. 2 186 (1836)

Dioecious shrubs or trees with alternate, mostly deciduous, not lobed leaves; stipules mostly present; flowers all in catkins which are mostly terminal or terminating short and lateral branches and mostly opening before the leaves, each flower being subtended by a membranous bract and without a calyx; stamens one to many on filiform filaments; ovary 1-celled with 2 stigmas and 2-4 parietal placenta and many small and hairy-tufted seeds; pod 2-valved; anthers 2-celled and opening lengthwise; wood white, soft and light in weight; bark bitter and tonic, very good for debility, fevers and liver troubles; twigs and wood mostly brittle. A family of 2 genera and 200 species, most abundant in the Temperate Life Zones, growing mostly near water. The wood is everywhere used for kindling and for making the highest grades of charcoal, it is occasionally made into lumber in the larger trees, but none but the cottonwoods grow large enough for lumber as a rule. The willows especially are used for poles and for brush fences everywhere and the twigs are much used for basket work and matting. All species are rapid growers.

Key to Genera.

1. *Floral scales entire; not resinous; flowers with small glands and no disks; stamens not over 5; buds with a single scale; catkins not resinous; leaves mostly narrow, never wider than long, simply pinnate-veined; mostly shrubs; pods small, ovate or narrower, 1-3 inches long.* 1. *Salix*.

2. *Floral scales lacerate; flowers with a large or cup-shaped disk; stamens many; buds with several mostly resinous scales; catkins mostly resinous, leaves mostly broad, often broader than long and often rhomboidal, with branched nerves; pods rather large, mostly nearly globose, and mostly about $\frac{1}{2}$ inch long; all are trees and often very large.*

2. *Populus*.

SALIX. Willow.

Tourn. L. Syst. (1735), Gen. 300, Sp. Pl. 1015.

Each flower with 1-2 small glands at base; stigmas short; branches mostly round. The pubescence of the scales and pods is variable; the stipules vary greatly and are not good for specific distinctions. A genus of about 175 species (*Salix*, the Latin name for willow).

Key to Species.

- A. Stamens 2. (except in *S. fragilis*).
 - AB. Cultivated trees.
 - Leaves wider above.
 - 1. *S. alba*.
 - Leaves wider below.
 - 2. *S. Babylonica*.
 - Stamens 5, leaves long pointed.
 - 3. *S. fragilis*.
- ABB. Scales dark-tipped; catkins not coming out after the leaves.
 - ABBC. Pods smooth.
 - ABBCD. Leaves entire; not alpine nor sub-alpine.
 - 4. *S. proluxa*.
 - ABBCDD. Leaves serrulate or finely toothed (entire in a few forms), normally acute.
 - ABBCDDE. Leaves not wider above, normally glaucous below.
 - Leaves with tapering apex.
 - 5. *S. cordata*.
 - Leaves often acute but not acuminate.
 - 6. *S. balsamifera*.
 - ABBCDDEE. Leaves evidently wider above, often acute, but not conspicuously acuminate; styles evident.
 - Leaves green on both sides, not glaucous.
 - 7. *S. Novae-Angliae*.
 - Leaves glaucous or pubescent below.
 - Leaves not pubescent below; pods nearly sessile; catkins sessile.
 - Leaves nearly linear; stipules small or none.
 - 8. *S. irrorata*.
 - Leaves oblanceolate to obovate; stipules conspicuous and persistent; styles long.
 - 9. *S. monticola*.
 - Leaves pubescent below at least when young; pods not sessile; styles about as long as the stigmas.
 - 10. *S. lasiolepis*.
 - ABBC. Pods pubescent.
 - ABBCDD. Not low alpine nor sub-alpine shrubs.

ABBCCDE. Styles very short or none; pods woolly; leaves broader above the middle.

11. *S. Scouleriana*.

ABBCCDEE. Styles longer than the stigmas. (*Scouleriana* would be sought here when the styles are long).

Leaves silvery-silky or woolly below only when young; catkins appearing with the leaves, large and many flowered; twigs not yellow.

12. *S. Lemmani*.

Leaves at least minutely silvery-silky below; catkins small, appearing before the leaves and without persistent bracts.

13. *S. glaucops*.

ABBCCDD. Low alpine or arctic or sub-alpine plants, not over a few feet high.

ABBCCDDE. Stems not prostrate, mostly erect in clumps.

ABBCCDDEF. Pods smooth; catkins thick, densely flowered, linear (except in *Wolfii*); styles elongated.

Catkins coming out before the leaves, sessile and without persistent bracts.

14. *S. Tweedyi*.

Catkins coming out with the leaves on leafy peduncles (*Richardsonii* might be sought here).

Catkins large on rather long peduncles, with large leaves.

15. *S. Barclayi*.

Catkins small on short peduncles over-topped by the relatively large leafy bracts.

16. *S. Wolfii*.

ABBCCDDEFF. Pods puberulent, but not silky villos; catkins coming out before the leaves, and sessile; densely flowered and linear; styles elongated; plants a foot or two high; leaves smooth and green; arctic plants.

Pods sessile, shortly acuminate; stipules narrowly lanceolate, not large; leaves with revolute margins; twigs thick.

17. *S. Richardsonii*.

Pods long-beaked; short-pedicled; branches slender.

18. *S. fulcrata*.

ABBCCDDEFFF. Pods silky or woolly.

ABBCCDDEFFFG. Catkins sessile, coming out before the leaves and without persistent leafy bracts; styles elongated; pods about sessile.

Catkins nearly 3 inches long, thick; twigs thick.

19. *S. Barrattiana*.

Catkins small, from nearly globose to 1 inch or so long; twigs smooth, chestnut colored; stipules none.

20. *S. chlorophylla*.

Catkins 3-4 inches long, thick; twigs yellowish-woolly.

21. *S. speciosa*.

ABBCCDDEFFFGG. Catkins seldom 1 inch long, on short, leafy peduncles, and coming out with the leaves; leaves paler below.

Leaves 1-2 inches long, entire, oblanceolate to elliptical and acute at both ends, deciduously silky.

Catkins oval to oblong, hardly as long as the bracts (*S. Wolfi* var. *pseudolapponum* comes here).

Catkins linear, densely flowered.

22. *S. glauca*.

Leaves 2-4 inches long, glandular-serrulate, mostly silky-villous; catkins large and linear.

23. *S. Californica*.

ABBCCDDEE. Stems prostrate or low and matted, a few inches high, alpine and arctic, mostly with subterranean twigs, leafy at the tips; leaves evergreen, leathery and reticulate; catkins mostly terminal and leafy bracted; styles elongated.

ABBCCDDEEF. Pods about sessile.

ABBCCDDEEFG. Leaves entire.

ABBCCDDEEFGH. Leaves smooth or only ciliate; scales obovate.

Leaves inclined to be narrowed at each end; last year's twigs angled; catkins long peduncled, linear, many flowered.

24. *S. Brownii*.

Leaves oblong-obovate and shortly acuminate or almost obtuse, 1-4 inches long, very much smaller than the above; catkins not over 1-3 inches long.

25. *S. Angloru*.

ABBCCDDEEFGHH. Leaves very pubescent; catkins about two inches long and many-flowered; pods long-silky; leaves about 2 inches long, a little revolute.

26. *S. artica*.

ABBCCDDEEFGG. Leaves glandular-serrulate, obliquely pointed; not lighter below; catkins linear; densely flowered except below.

27. *S. Myrsinites*.

ABBCDDDEEFF. Pods distinctly pediceled; ashy; catkins not terminal, linear and densely flowered; leaves obovate, smooth, margins serrulate.

28. *S. Chamissonis*.

ABBB. Pistillate scales (at least), not black, except in *S. petiolaris*, mostly yellowish or rarely reddish, catkins peduncled and leafy bracted, or terminal on short leafy branches (sessile in *S. Drummondiana*).

ABBBC. Low alpine or arctic plants; pods not long-stipitate (*S. myrtilloides* has a long stipe and is not alpine nor arctic).

ABBBCD. Herbaceous branches very short, about 1 inch above ground; leaves from round and notched at both ends to oblong-elliptical, smooth, shining, prominently veined; catkins short, loosely 3-9-flowered, with 2-3 bracts; style evident.

Catkins terminal; pods smooth.

Catkins with two normal leaves which are longer than they are; leaves with crenulate margins.

29. *S. herbacea*.

Leaves entire; pods very shortly pediceled and with very short style.

30. *S. rotundifolia*.

Catkins sometimes lateral, oval; pods variably white-woolly, rarely smooth.

31. *S. polaris*.

ABBCDD. Shrubby plants.

ABBBCDDE. Leaves very obtuse above and rounded (except *S. reticulata* var. *nivalis*).

ABBBCDDEF. Nearly prostrate plants a few inches high, with subterranean trunk; leaves entire, paler below; catkins long-peduncled, linear, terminal; pods ovate, white-woolly; styles 2-cleft or none.

Leaves inclined to be wider above and obtuse, rugose; petioles half the blade; styles very short; scales hairy below (except in the variety)

32. *S. reticulata*.

Leaves mostly round, the petiole often equaling the blade, closely net-veined below, rather revolute; catkins densely flowered; scales smooth; styles none.

33. *S. orbicularis*.

ABBBCDDEFF. Shrubs with trunks a foot or two high, with widely spreading branches running over the ground. (*S. Chamissonis* might be sought here).

Leaves smooth or soon so, paler below; catkins lateral.

34. *S. ovalifolia*.

Leaves silvery-silky below, nearly 2 inches long, catkins short-peduncled and bractless, but

terminal on short leafy branches of the season.

35. *S. vestita*.

ABBBCDDEE. Catkins lateral on leafy peduncles; leaves acute on both ends. (*S. Brownii* var. *tenera* would be sought here).

Styles elongated and pods nearly sessile.

36. *S. phyllicoides*.

Styles very short; catkins slender and sparsely flowered; pods long-stipitate; scales oblong, smooth or long-ciliate.

37. *S. myrtilloides*.

ABBBC. Shrubs a few feet high, sub-alpine; branches mostly erect or not decumbent; scales broad.

ABBBCD. Leaves narrow but not linear, midrib conspicuous and yellow; pods sessile or nearly so.

Leaves not revolute, entire, thinly-straight-hairy on both sides; stipules minute; catkins about 1-2 inches long; pods sessile.

38. *S. desertorum*.

Leaves revolute, remotely denticulate, loosely woolly above and densely so below; stipules about as long as short petiole; catkins closely flowered and the fertile ones at least two inches long; pods short-stipitate.

39. *S. candida*.

ABBBCDD. Leaves obovate, broad; pods evidently stipitate.

40. *S. Drummondiana*.

ABBBCCC. Slender shrubs or trees 10 feet or more high, not alpine nor sub-alpine.

ABBBCCD. Leaves a trifle wider above, not linear, paler below, sparsely pubescent, variably silky when young; catkins coming out with the leaves and leafy bracted; pods acuminate and long-stipitate; styles short; fertile scales narrow; plants of the Middle Temperate Life Zone.

ABBBCCCDE. Leaves acute, mostly obtuse at base, slender-petioled; catkins narrow and longer than the bracts.

Leaves thin and entire when young, pale; fertile catkins peduncled and with large, leafy bracts; scales yellow.

41. *S. rostrata*.

Leaves sharply serrulate, glaucous below; catkins nearly sessile with a few short, leafy bracts; scales black tipped and yellowish below.

42. *S. petiolaris*.

ABBBCCCDEE. Leaves narrowly oblanceolate and acute at both ends, very short-petioled, entire, 1-2 inches long; fertile catkins oval or broadly oblong,

barely surpassing the bracts, almost sessile, 6-9 lines long.

43. *S. macrocarpa*.

ABBBCCDD. Leaves linear or nearly so, fertile catkins coming out after the leaves on leafy branches; scales from linear-lanceolate to broadly-oblancoate, but narrow and long (rhomboidal in *taxifolia*), yellowish, smoothish above; plants of the Tropical and lower Temperate Life Zones.

Leaves inclined to be remotely denticulate, one to four inches long; catkins mostly linear and mostly many flowered.

44. *S. longifolia*.

Leaves linear and about 1 inch long, very many; catkins nearly globular, seldom over 10-flowered; scales inclined to clasp the pod.

45. *S. taxifolia*.

AA. Stamen 1; anthers black; scales reddish with rather dark tip; native shrubs.

46. *S. pellita*.

AAA. Stamens mostly 5, not 2; scales yellow, very thin, not darker above; all catkins coming out with the leaves and leafy-bracted; trees or tall shrubs with bark rough below; pods smooth and stipitate; none alpine nor sub-alpine, mostly growing in the lower Temperate and Tropical Life Zones; natives.

AAAB. Petioles not glandular nor viscous; catkins long-peduncled, linear (broader in *S. lasiandra*).

AAABC. Leaves thin, linear to linear-lanceolate and tapering from near the base to a long acumination; petiole 2-4 lines long.

Leaves lighter below; internodes slender.

47. *S. nigra*.

Leaves not lighter below, very slender and tapering; internodes short.

48. *S. Humboldtiana*.

AAABCC. Leaves narrowly elliptical to oblong lanceolate, variably glaucous below, rather shortly-acuminate; pods ovate, about 1 line long.

Leaves thin, smooth on both sides and including the 6-9 line long petiole.

49. *S. amygdaloides*.

Leaves leathery, not thin, with short, downy petioles and often silky when young.

50. *S. laevigata*.

AAABCCC. Leaves linear-elliptical, shortly acuminate, remotely denticulate, on short and stout and woolly petioles; very glaucous below.

51. *S. Bonplandiana*.

AAABB. Petioles glandular or viscous and often with raised glands near the top; shrubs 10-20 feet high, tufted and erect; catkins thick; growing in the middle Temperate Life Zones along streams.

Leaves from ovate to lanceolate, rather rounded at base; catkins short-peduncled.

52. *S. lucida*.

Leaves acute at base; catkins long-peduncled, large.

53. *S. lasiandra*.

A. *Stamens 2 (except in S. fragilis).*

AB. *Cultivated plants, all trees; pods smooth; leaves narrow and acuminate at both ends, sharply serrulate.*

1. *S. alba* L. 1021. **White Willow.** (*alba*, white).

Leaves lanceolate, mostly larger above the middle; branches not conspicuously drooping. Occasionally planted throughout our region.

2. *S. Babylonica* L. 1017. **Weeping Willow.** (*Babylonica*, Babylonian).

Leaves largest near the base and then long-acuminate, nearly linear; often coiled; branches very slender and drooping. Very common in cemeteries.

3. *S. fragilis* L. 1017. **Brittle Willow.** (*fragilis*, brittle, frail).

Stamens 5; pods lanceolate, much longer than the pedicels, smooth; leaves lanceolate and long-acuminate; scales deciduous; twigs brittle at base. Occasionally cultivated in Colorado, etc.

ABB. *Native species; scales dark-tipped; catkins not coming out after the leaves.*

ABBC. *Pods smooth; not alpine nor sub-alpine shrubs.*

ABBCD. *Leaves glaucous below and smooth, entire; pods long-stipitate; catkins coming out with the leaves and leafy-bracted, sparsely flowered; styles almost none; branches slender; low shrubs 1-3 feet high, growing in bogs.*

4. *S. proluxa* And. Mon. Sal. 94 (1867). **Long pediceled Willow.** (*proluxe*, much-produced).

Catkins short-peduncled, the fertile ones 2 inches long and very sparsely flowered; scales of staminate flowers densely white-hairy; pods ovate-conic, strongly beaked, 2 lines long, on a pedicel longer than the scale; leaves obovate-lanceolate, acuminate; green stipules 2-3 times shorter than the petioles. This grows near the boundary of Montana, in British America, and northward.

ABBCDD. *Leaves serrulate or finely toothed (entire in some forms), normally acute.*

ABBCDDE. *Leaves normally glaucous below, not wider above the middle; pods stipitate; styles short; catkins coming out before the leaves; slender shrubs about 10 feet high.*

5. *S. cordata* Muhl. Neue Schrift. Ges. Nat. Fr. Berlin 4 236 t 6 f 3 (1803.) **Heart-leaved Willow.** (*cordata*, heart-shaped referring to the base of the leaf).

Leaves acuminate, often falcate, mostly cordate at base, oblong-lanceolate, sharply glandular-serrulate; stipules normally large and persistent, pods in the type short-stipitate, narrowly-ovate; branches brown. Common in the Middle Temperate Life Zones. Much used for brush fences and kindling wood.

S. cordata var. Watsoni Bebb Bot. Cal. 2 86 (1880). *S. cordata* var. *lutea* Bebb. **Yellow-twigged Willow.** (*Watsoni*, *Watson's*). *S. padophylla* Rydberg, *S. flava* Rydberg.

Branches smooth and yellow; leaves oblong and short-acuminate, obscurely serrulate, 1-3 inches long; catkins about 1 inch long. This grows on both sides of the Sierras and also in the mountains of Colorado and Utah; connecting forms occur at Weiser, Idaho., etc.

S. cordata var. Mackenziana Hooker Fl. Bor. Am. 2 149 (1839). **Mackenzie's Willow.** (*Mackenziana*, *Mackenzie's*).

Pods long-stipitate, the stipe being as long as the ovate or oblong-ovate pod; leaves elliptical-oblong and shortly-acuminate, rarely wider above, acute at base; stipules very small; bark gray and smooth; twigs green; often tall trees. Ogden, Utah, both side of the Sierras and northward, apparently not common.

S. cordata var. angustata (Pursh) and. Pursh Fl. 613 (1814) as species; And. Mon. Sal. 159 (1867). **Narrow Leaved Willow.** (*angustata*, narrowed).

Leaves linear-lanceolate, acute at base, rarely wider above, nearly entire; pods on short pedicels. This has the range of the type, from the mountains of Arizona and northward.

6. **S. balsamifera** Barratt Hook. Fl. Bor. Am. 2 149 (1839). *S. cordata* var. *balsamifera* l. c. **Balsam Willow.** (*balsamifera*, balsam-bearing).

Leaves oblong-ovate, sharply acute, but not acuminate, obtuse at base, minutely serrulate; stipules minute; pods lanceolate or narrower, the stipe twice the scale. Saskatchewan to British Columbia in the Upper Temperate Life Zone. Rare. Probably not distinct from *S. cordata*. Figured in Torrey Bulletin 15 121.

ABBCDDEE. Leaves evidently wider above, oblanceolate or wider, often acute, but not conspicuously acuminate; styles evident; leaves glaucous below except in the first; mostly shrubs about 10 feet high (typical lasiolepis is a tree and one form of it and one of Novae-Angliae are shrubs 2-3 feet high).

ABBCDDEEF. Leaves green on both sides and not glaucous; pods short-stipitate.

7. **S. Novae-Angliae** And. Mon. Sal. 160 (1867). **The Mountain Willow.** (*Novae-Angliae*, of New England, meant for British America, an inappropriate name).

Leaves elliptical-oblong, obtuse or nearly so, 1-2 inches long, the early ones as long as the oval-oblong young catkins which do not greatly elongate and are short-peduncled; pods conical and beaked, stipe about twice the nectary; stipules small or none. From the Saskatchewan to the Pacific and northward in the Upper Temperate Life Zone of British America.

S. Novae-Angliae var. pseudocordata. And. Mon. Sal. 161. (1867) **The false-cordata variety.** *S. myrsinites* var. *curtifolia* And., *S. curtifolia* (And.) Rydberg. (*pseudocordata*, false-cordata, referring to its relationship to *S. cordata*).

Tip of leaves somewhat produced and acute; pods short-stipitate, long-beaked; leaves of the type but somewhat narrowed below. This is the common mountain form and can hardly be separated from *S.*

cordata except by arbitrary characters, which are leaves green on both sides, pods short-stipitate, young catkins oblong-oval. Occasional in the middle elevations of Colorado to the East Humboldt Mountains, Nevada, and as far south as Marysville, Utah, and northward.

S. Novae-Angliae var. pseudomyrsinites And. Sal. Bor. Am. 129 (1858) (And.) pseudomyrsinites, false-myrsinites). **The false-myrtle variety.**

A low shrub 1-3 feet high with divaricate branches, small membranous leaves about 18 lines long, and a stipe about three times the nectary. This occurs in the Rocky Mountains of British America to the Saskatchewan and northward.

S. Novae-Angliae var. myrtillifolia And. Sal. Bor. Am. 132 (1858) (myrtillifolia, myrtle-leaved). **The Myrtle-leaved variety.**

A very low shrub widely spreading; leaves 3-5 lines long, dense; pod shortly-stipitate; this grows in boggy places in the mountains of British America to the Saskatchewan, etc.

ABBCDDEEFF. Leaves not pubescent, oblanceolate, acute; pods nearly sessile; styles merely evident; catkins sessile.

8. S. irrorata And. Ofvers. Vet. Akad. Forh. 117 (1858). **Glaucous Willow.** (Irrorata from the Latin in not, and rorare, to bedew, the application of the name uncertain).

Leaves nearly linear, bright-green above, strongly glaucous below; stipules minute or none; catkins appearing before the leaves, sessile, linear, elongated, densely flowered; last year's twigs generally with a glaucous bloom, shrubs 6-8 feet high. This grows in foot hills in the Middle Temperate Life Zone from the edge of the plains in Colorado to Silver City, New Mexico, and northward, but not yet known in Utah.

9. S. monticola Bebb. in Coulter's Man. 336 (1885). (monticola, inhabitant of the mountains). **Foothill Willow.**

Stipules large and persistent; pods conical-ovate, about sessile; styles elongated; catkins thick; leaves rather rigid, 3-6 inches long, the earliest often obovate; shrubs 8-12 feet high. Apparently not common, Upper Temperate Life Zone in the mountains of Colorado and Marysville, Utah.

ABBCDDEEFF. Leaves oblanceolate, acute, white-pubescent below at least when young, becoming rusty-colored; pods not sessile.

10. S. lasiolepis Benth. Pl. Hartw. 335 (1857) **Silky-Scaled Willow.** (lasiolepis from the Greek meaning silky-scaled).

Leaves in the type from oblanceolate to oblong-oblanceolate and shortly-acuminate, large, the early ones often spatulate-obovate and obtuse), leathery; dark and shining above, permanently glaucous below, and also sparsely silky when young, the ribs mostly rufous, margins conspicuously and rather remotely and irregularly denticulate; stipules small, often wanting; catkins sessile, only the fertile ones with a few bracts, linear, densely flowered, long; pods ovate-conic, on a pedicel not as long as the scale; styles about as long as the short stigmas; scales densely long-silky; twigs yellowish. This

seems to be confined to the lower lands of California, especially in the South, and is a large tree, in the Tropical Life Zone. Much used for kindling wood and brush fences, it is a straight tree with straight branches.

S. lasiolepis var. Bigelovii (Torr.) Bebb. Bot. Cal. 2 86 (1880); S. Bigelovii Torr. Pac. R. R. Rep. 4 139 (1857), S. Piperi, Bebb. Gard. & Forest 8 482 (1895). **Bigelow's Willow.**

Leaves mostly small, oblanceolate to nearly spatulate, rounded to very shortly acute, entire, inclined to silky below; pods with stipe fully as long as the scale or more; bark smooth except on the young twigs, which are pubescent; a shrub 8-15 feet high mostly. The low forms appear like *S. desertorum* except for the smooth pods. Common throughout the mountains of California in the Lower Temperate Life Zone at least to the edge of the Tropical and eastward through the Panamints to the Colob near Springdale, Utah, growing along streams.

ABBCC. Pods pubescent.

ABBCCD. Not low alpine nor sub-alpine shrubs.

ABBCCDE. Styles very short or none; pods woolly.

11. **S. Scouleriana** Barratt. in Hook. Fl. Bor. Am. 2 145 (1839) **Scouler's Willow.** (*Scouleriana*, Scouler's) *S. flavescens* Nutt., S. Nuttallii Sargent.

Leaves obovate to oblanceolate, normally with rounded apex and cuneate base, but on vigorous shoots sometimes shortly-acuminate and base narrowed but rather truncate, dull and dark-green, and at length smooth above, much paler below as if glaucous, mostly silvery with very minute pubescence below, large, margin mostly entire, catkins coming out before the leaves, sessile, long and slender, densely flowered; pods lanceolate, about 2-3 lines long, on a variable stipe from very short to longer than the scales; styles normally none but they vary to as long as the linear stigmas; scales normally acute but often rounded, villous; twigs of the fertile plants lemon-yellow, of the male plants reddish; old stems smooth and gray. This is readily separable from other willows by the peculiar leaves, or when they differ, by the sessile stigmas. Some forms approach *S. Lemmoni*. This is the most common willow of the Middle Temperate Life Zone from the edge of the mountains near the plains in Colorado and probably New Mexico to Fish Lake, Utah, and the southern Sierras of California and northward. Normally it is a slender tufted and erect shrub 15-20 feet high, with wood white to the core, growing along cold streams and springs. The most common form is the **var. brachystachya** (Benth. Pl. Hartw. 336 (1857) as species) with sessile stigmas, short stipes and obtuse leaves, which hardly deserves varietal rank. Much used for brush fences and kindling wood and poles.

ABBCCDEE. Styles longer than the stigmas.

ABBCCDEEF. Leaves puberulent and lighter below but not silvery-silky nor woolly, except when young; catkins large and many-flowered, the fertile ones 1-2 inches long; twigs not yellow. S. Scouleriana would be sought here when the styles are long, but the catkins appear before the leaves and are sessile.

12. **S. Lemmoni** Bebb. Bot. Cal. 2 88 (1880) **Lemmon's Willow.** (Lemmoni, Lemon's).

Leaves lanceolate to elliptical, acute at both ends, paler but not glaucous below, silky when young; catkins appearing with the leaves, and with leafy and persistent bracts; the fertile ones peduncled; stipes short; pods ovate-lanceolate, variably woolly. A shrub 6-15 feet high growing in the Upper Temperate Life Zone from the Wasatch to the Sierras and northwestward.

ABBCCDEEFF. Leaves at least minutely silvery-silky below, narrow and very acute; catkins small, appearing before the leaves and without persistent bracts.

13. **glaucops** And. in DC. Prod. 16 2 281 (1868). **Glaucous Willow.** (glaucops, having the appearance of glauca), *S. glauca* var. *villosa* And., *S. subcœrulea* Piper.

Leaves linear-elliptical, acute at base and rather acuminate at tip, entire, 2-3 inches long, dark green and rather dull above; stipules when present lanceolate; catkins linear, about 9 lines long; pods ovate to lanceolate on a stipe about as long as the scale; twigs slender and in the type purplish and with a glaucous bloom. A very slender and graceful shrub, growing in spreading tufts about 8 feet high. Upper Temperate Life Zone and going down into the lower zones somewhat, along cold streams. Common in the mountains of Colorado and probably New Mexico through Fish Lake and Marysville, Utah, to the Sierras of California and northward.

S. glaucops var. **glabrescens** And. DC. Prod. 16 2 281 (1868) **The smoothish variety.** (glabrescens, becoming glabrous), *S. bella* Piper.

This differs from the type in the shining yellow twigs, smooth upper side of the leaves and very silvery-silky under side, and nearly sessile pods. Middle Temperate Life Zone of the Columbia Basin and northward.

ABBCCDD. Low alpine or arctic or sub-alpine plants, not over a few feet high.

ABBCCDDE. Stems not prostrate, mostly erect in clumps.

ABBCCDDEF. Pods glabrous; catkins thick, densely flowered, linear (except in *Wolfii*); styles elongated; outer stems often divaricate, plants 3-6 feet high, related to *S. cordata*.

ABBCCDDEFG. Catkins coming out before the leaves, sessile, without persistent leafy bracts.

14. **S. Tweedyi** (Bebb. Cont. Nat. Herb. 3 572 (1896) as *Barrattiana* var. *Tweedyi*. **Tweedy's Willow.** (Tweedyi, Tweedy's).

Catkins large, 2 inches long, sessile; pods conical, large, almost sessile; leaves 2-3 inches long, oval-oblong, acutish, cordate at base, finely glandular-serrulate, at first floccose-pubescent, but soon smooth on both sides; a low shrub with widely spreading branches. Big Goose Creek, Wyoming, Big Horn Mountains.

ABBCCDDEFGG. Catkins on leafy peduncles, coming out with the leaves. *S. Richardsonii* might be sought here.

15. **S. Barclayi** And. Ofvers. Vet. Akad. Forh. 125 (1858). **Bar-**

clay's Willow. (Barclayi, Barclay's). *S. commutata* Bebb., *S. conjuncta* Bebb.

Catkins on rather long, leafy peduncles which have the leaves large and persistent; pods ovate at base and acuminate, oblong-obovate occasionally, from smooth to sparsely pubescent, on short pedicels, about 2 lines long; early leaves elliptical and acute at both ends or a trifle larger above, not conspicuously reticulated, later leaves often oval-obovate and rounded at tip and truncate at base and conspicuously reticulated, from perfectly smooth and equally green on both sides to silvery-silky with long hairs which are mostly deciduous. Remarkably variable in the pubescence even to the pods, styles stigmas and margins of leaves also variable. Growing in boggy or wet meadows, the outer stems often nearly horizontal, forming large and tangled tufts about 5 feet high. Stein's Mountain eastern Oregon, Sawtooth Mts. southern Idaho and northwestward, and probably also in Montana.

16. **S. Wolfii** Bebb. Wheeler's Rep. 241 (1878). **Wolf's Willow.** (Wolfii, Wolf's). *S. Wyomingensis* Rydberg Torr. Bull. 28 271 (1901).

Catkins on short but very leafy peduncles, oval to oblong, about 6-9 lines long, mostly over-topped by the large leafy bracts; leaves oblanceolate to elliptical and acute at both ends, entire, silky when young; with age smooth and green on both sides; stipules none; pods oblong-obovate, about sessile. A low shrub of the high mountains of Colorado and northward.

S. Wolfii var. pseudolapponum (Seeman in Engler's Bot. Jahrb. 29 beilbe 65 28 (1900) as species.) **False-Lapland Willow.** (*pseudolapponum*, false Lapland).

This differs in no respect from the type except in the silky-woolly pods and longer peduncles. Tufted shrubs 3-5 feet high. Common in the mountains of Colorado westward to Marysville, Utah, and the East Humboldt Mts. of Nevada and northward.

ABBCCDDEFF. Pods puberulent but not silky-villous; catkins coming out before the leaves and sessile, densely flowered and linear; styles elongated; leaves paler below, acute, inclined to be larger above the middle; plants 1-2 feet high.

17. **S. Richardsonii** Hook. Fl. Bor. Am. 2 147 t. 182 (1838). **Richardson's Willow.** (*Richardsonii*, Richardson's).

Pods smooth or ashy, sessile, ovate-acuminate; leaves smooth and green, lanceolate to elliptical, acute at both ends, margins revolute, and closely serrulate; stipules narrowly lanceolate; a low shrub with widely-spreading branches and thick and woolly twigs. Arctic.

18. **S. fulcrata** And. Mon. Sal. 139 t 73 (1867). **Stipuled Willow.** (*fulcrata*, stipuled).

Pods long-beaked from an ovate base, ashy, short-pedicled; leaves obovate-oblanceolate, crenulate, very smooth; stipules very large; branches slender. Arctic.

ABBCCDDEFFF. Pods silky or woolly.

ABBCCDDEFFFG. Catkins sessile, coming out before the leaves and without persistent leafy bracts; pods about sessile; styles elongated; shrubs several feet high.

19. **S. Barratiana** Hook Fl. Bor. Am. 2 146 t 187 (1838). **Barratt's Willow.** (*Barratiana*, Barratt's).

Catkins in the type nearly 3 inches long, thick and densely flowered, and with acute and oblong scales; pods oblong-ovate, variably silky to almost smooth; leaves on vigorous shoots oblong-ovate and acute, with truncate base, serrulate, the other leaves elliptical-lanceolate and acute at both ends and entire, either smooth from the first and green on both sides or silky-hairy; stipules sometimes as long as the short petioles, often small; a widely spreading low shrub with thick branches, reticulated leaves and very variable pubescence. From near the British boundary to the Arctic. *S. Tweedyi* may be a variety of this.

20. *S. chlorophylla* And. Vet. Akad. Handl. Stockh. 6 1 138 (1867) **Yellow-Leaved Willow** (*chlorophylla*, from the Greek, meaning yellow leaved.)

Catkins from, nearly globose to $\frac{1}{2}$ inch or so long; pods silky; leaves and twigs smooth, chestnut-colored, the former a little paler below; stipules none. Common in the high mountains of Colorado as far south as La Plata Mt. and northward.

21. *S. speciosa* H. & A. Bot. Beech. 130 (1832). **The Handsome Willow.** (*speciosa*, handsome).

Catkins 3-4 inches long, densely hairy, thick; scales acute, longer than the pods; pods ovate-acuminate, sessile, silky-woolly; leaves obovate to oblong-oblancheolate, acuminate, entire, greenish above and silvery-woolly below; stipules linear-lanceolate, longer than the petioles, twigs yellowish-woolly; a rather tall shrub. In the high mountains of British America and arctic.

ABBCCDDEFFFGG. Catkins seldom an inch long, on short leafy peduncles, coming out with the leaves; leaves paler below.

ABBCCDDEFFFGGH. Leaves 1-2 inches long, entire, oblanceolate to elliptical and acute at both ends, decidedly silky.

S. Wolfii var. *pseudolapponum* would be sought here with oval to oblong catkins hardly as long as the bracts.

22. *S. glauca* L. 1446. **The Glaucous Willow.** (*glauca*, glaucous).

Catkins linear, densely flowered; pods ovate-lanceolate, densely silky-woolly, nearly sessile; leaves silky-haired when young and glaucous below, reticulated; branches shining and reddish, widely-spreading; a low shrub from a few inches to a few feet high. Arctic. Reported from the Big Horn Mts., Wyoming.

ABBCCDDEFFFGGHH. Leaves 2-4 inches long, glandular-serrulate, mostly silky-villous; catkins large and linear.

23. *S. Californica* Bebb. Bot. Cal. 2 89 (1880) **The Californian Willow.** (*Californica*, Californian).

Pods ovate with a slightly produced tip, about 2 lines long, shortly-woolly, on a short stipe; leaves normally elliptical-oblancheolate with a shortly-acuminate tip and narrowed but truncate base, sparingly long-silky at least when young; stipules rather large; catkins much longer than the large and leafy bracts, loosely flowered below and long-peduncled; shrubs about 5 feet high, growing in wide tufts in sub-alpine gravelly places and having decumbent outer branches, variably pubescent. Common in the Sierra Nevadas of California.

ABBCCDDEE. Stems prostrate or low and caespitose, a few inches high, alpine and arctic, stems subterranean mostly with ascending twigs, which are leafy at the tip; leaves leathery and reticulated; catkins mostly terminal, leafy-bracted, thick; styles elongated; leaves evergreen, shining, punctate and with elevated nerves, serrulate; pods, triangular-ovate, pubescent.

ABBCCDDEEF. Pods about sessile.

ABBCCDDEEFG. Leaves entire.

ABBCCDDEEFGH. Leaves smooth or only ciliate; scales obovate.

24. **S. Brownii** (And.) Bebb.; And DC. Prod. 16 2 286 (1868) as arctica var. *Brownii*; Bebb. Bot. Gaz. 14 116 (1889). **Brown's Willow**. (*Brownii*, *Brown's*), *S. arctica* var. *petraea* And.

Leaves narrowly elliptical to lanceolate, rarely obovate to spatulate, 1-3 inches long, inclined to be narrow at each end; pods puberulent to white-woolly, but the pubescence rather deciduous, large; last year's twigs angled; catkins long-peduncled, linear, many flowered; scales are occasionally reddish-black only at tip; very variable. Common in the Frigid Life Zone of the Mts. of Colorado to the Sierras and northward.

S. Brownii var. *tenera* (And. DC. Prod. 16 2 288 (1868) as species). **The Tender Variety** (*tenera*, tender), *S. petrophila* Rydberg.

Fertile scales yellow. This has the same range as the species.

25. **S. Anglorum** Chamisso in Linnaea 6 541 (1831): **Box-leaved Willow**. (*Anglorum*, of the English, referring to the English collectors), *S. phlebophylla* And.

Leaves oblong-obovate and shortly acuminate or almost obtuse, 4 lines long by 2 lines wide; catkins 3-4 lines long; pods softly puberulent; a diminutive willow of the high arctic regions. Reported by Dawson from North Kootenai Pass, B. C. The forms of this species reported from the Rocky Mountains are *S. Brownii* var. *tenera*.

S. Monica Bebb. Bot. Cal. 2 90 (1880) would come here, but it is an obscure and not valid species.

ABBCCDDEEFGHH. Leaves softly pubescent.

26. **S. arctica** Pallas Fl. Ross. 2 86 (1815). **The Arctic Willow**. (*arctica*, arctic), *S. Pallassii* And.

Catkins elongated, about 2 inches long, many flowered; scales obtusish; pods conical, long-silky; leaves obovate, rounded or very shortly-apiculate, about 2 inches long, a little revolute, hardly paler below. Arctic.

ABBCCDDEEFGG. Leaves glandular-serrulate.

27. **S. Myrsinites** L. 1018. **Myrtle-like Willow**. (*Myrsinites*, Myrtle-like).

Catkins linear, densely flowered except below; scales spatulate-ovate; pods ovate-triangular, hairy, ferruginous; leaves 6-12 lines wide, lanceolate to ovate-lanceolate or oval, obliquely acuminate, not lighter below; stipules ovate-lanceolate; very variable. Arctic.

ABBCCDDEEFF. Pods distinctly pedicled.

28. *S. Chamissonis* And. DC. Prod. 16 2 290 (1868) **Chamisso's Willow.** (*Chamissonis*, Chamisso's).

Catkins lateral, linear, densely flowered except at base; scales acutish; pods triangular-ovate, ashy; leaves obovate, very shortly apiculate, very smooth on both sides, paler below, margins acutely serrulate; stipules small; peduncles bare above. High arctic.

ABBB. Pistillate scales at least not black (except in *S. petiolaris*), mostly yellowish or rarely reddish; catkins peduncled and leafy bracted, or terminal on short leafy branches (sessile in *S. Drummondiana*).

ABBBC. Low alpine or arctic plants; pods not long-stipitate (except in *S. myrtilloides*).

ABBBBCD. Herbaceous, branches very short (about an inch above ground), ascending; leaves from orbicular and emarginate at both ends to oblong-elliptical, smooth, shining, leathery, prominently reticulated; catkins 2-3-bracted, short, loosely and 3-9-flowered; scales rounded to retuse, reddish-yellow; pods conical-subulate from an ovate base; styles evident but often very short.

29. *S. herbacea* L. 1018. **The Dwarf Willow.** (herbacea, herb-like).

Catkins terminal, not half an inch long, shortly-peduncled, subtended by two normal leaves which are longer than the catkins; leaves from reniform to oval, with crenulate margins, on slender petioles; pods smooth, 2 lines long, acuminate from an ovate base; a matted herb. This grows in the Selkirk Mts., British America, and northward.

30. *S. rotundifolia* Traut. Mem. Acad. Mosc. 8 304 (1832). **Round-leaved Dwarf Willow.** (rotundifolia, round-leaved).

Catkins terminal; pods smooth, ovate-lanceolate, very shortly pediceled; style, evident but short; leaves orbicular, emarginate, entire, northern Alaska.

31. *S. polaris* Wahl. Fl. Lapp. 473 (1812). **The Polar Willow.** (polaris, polar), *S. Dodgeana* Rydberg.

Catkins sometimes lateral, oval; pods ovate, variably white-woolly, rarely smooth; leaves orbicular to oval, emarginate to obtuse, margins normally entire; this varies toward *S. herbacea*. Northern Alaska. Reported from Yellowstone Park, Wyoming.

ABBBBCDD. Shrubby plants.

ABBBBCDDE. Leaves very obtuse above and rounded (except *S. reticulata* var. *nivalis*).

ABBBBCDDEF. Nearly prostrate plants a few inches high from a subterranean trunk; leaves entire, paler below; catkins long-peduncled, linear, terminal; pods ovate, white-woolly; styles 2-cleft or none.

32. *S. reticulata* L. 1018. **Net-Veined Willow.** (reticulata, reticulated).

Leaves about 1 inch long, elliptical to round, inclined to be a trifle wider above, obtuse, rugose above, almost glaucous below; petiole half the blade; pods broadly ovate, white-woolly; styles very short; scales obovate to very broad, smooth above, in the type a little woolly below; catkins mostly 5-10-flowered; twigs very short. Arctic.

S. reticulata var. *nivalis* (Hooker) And., Hooker Fl. Bor. Am. 2 152

(1838) as species; And. DC. Prod. 16 2 301 (1868) **The White Willow.** (*nivalis*, white or shining); *S. saximontana* Rydberg.

Leaves 1-2 inches long, narrowly elliptical to oval, often acutish at both ends, glaucous below but very variable, less reticulated; scales generally without pubescence. Common above timber line in the high mountains of Colorado, the Uintas and Wasatch in Utah, and northwestward to the Wallawas of eastern Oregon and northward.

33. S. orbicularis And. DC. Prod. 16 2 300 (1868). **The Round-leaved Willow.** (*orbicularis*, round).

Leaves orbicular to orbicular-obovate, about an inch long; long-petioled, petiole often equaling the leaves, closely reticulated below, somewhat revolute; catkins slender, densely-flowered; scales round-obovate, smooth; pods broadly-ovate, acutish, thinly-white-woolly; styles none; stems creeping and rooting far and wide, the twigs short, black, 2-3-leaved and smooth. Sitka and northward.

ABBBCDDEFF. Shrubs a foot or two high with widely-spreading branches running over the ground.

ABBBCDDEFFG. Leaves smooth or soon so, paler below; catkins lateral. *S. Chamissonis* And. might be sought here.

34. S. ovalifolia Trautv. Mem. Soc. Nat. Mosc. 8 306 (1832). **The Oval-leaved Willow.** (*ovalifolia*, oval-leaved).

Leaves elliptical to oval, 1 inch long, sometimes with deciduous hairs below, entire; scales obovate and rounded, folded around the pods below; pods oblong-lanceolate, glabrous, almost sessile, 1 line long; styles distinct but short; catkins oblong to oval and densely flowered, about 6 lines long. The var. *pubescens* And. has softly pubescent pods. Arctic.

ABBBCDDEFFGG. Leaves silvery-silky below, nearly 2 inches long; catkins short-peduncled and bractless, but terminal on short, leafy branches of the season.

35. S. vestita Pursh. Fl. 2 610 (1814). **The Covered Willow.** (*vestita*, covered, referring to the permanent hairs of the leaves.)

Leaves oblong-oval to oval, mostly acute below, dark green on the upper side, margins revolute and rarely obscurely crenulate; catkins terminal, linear (the male ones very narrow), few flowered below; pods oblong-oval, obtuse, sessile, white-woolly; styles very short; stems sometimes 2-3 feet high, but mostly low and spreading, in rocky places forming very wide and straggling clumps. Upper Marias Pass, Flathead Lake, Montana, to the Wallowa Mts., Oregon and northward.

ABBBCDDEE. Catkins on lateral leafy peduncles; leaves acute at both ends.

ABBBCDDEEF. Styles elongated; pods sessile. *S. Brownii* var. *tenera* would be sought here.

36. S. phyllicoides And. Sal. Bor. Am. 123 (1858). **Rhamnus-like Willow** (*phyllicoides*, a Greek word with a Latin suffix, meaning rhamnus-like).

Leaves elliptical-oblong-oval, about 2 inches long, smooth, much paler below, minutely crenulate; pods conical, acute, ashy-silky, nearly

sessile; stipules narrowly lanceolate and long-persistent, as long as the petioles; catkins 2-3 inches long and 6 lines wide, many flowered; scales acute. Arctic.

ABBBBCDDEEFF. Styles very short; catkins slender, sparsely flowered; scales oblong, smooth or long-ciliate; pods long-stipitate.

37. *S. myrtilloides* L. 1019. **Myrtle-like Willow** (*myrtilloides*, myrtle-like).

Leaves narrowly elliptical, shortly acute at both ends, nearly 1 inch long, entire, short petioled, rather lead-colored, paler below, finely reticulated, clustered; pods lanceolate, glaucous, smooth, 2 lines long on a stipe about equaling them; stems slender, ascending, a few inches high; stipules almost none; scales of male flowers sparsely hairy and light colored. This grows from the Pacific to the Atlantic from near the British boundary northward.

ABBBCC. Shrubs a few feet high, sub-alpine; branches nearly erect or not decumbent; scales broad.

ABBBCCD. Leaves narrow but not linear, midrib conspicuous and yellow; pods sessile or nearly so.

38. *S. desertorum* Rich. Frank. Jour. App. 371 (1823). **Mountain Willow**. (*desertorum*, of the deserts, an inappropriate name). *S. stricta* (And.) Rydberg; *S. Cusickii* Rowlee. ined., *S. Wolfii* var. *Idahoensis* Ball., *S. leucosericea* Rydberg.

Leaves 6-30 lines long, narrowly elliptical to oblanceolate, acute, mostly obliquely truncate at the narrowed base, entire, thinly appressed-hairy on both sides, glaucous below, becoming smoother above; stipules minute; catkins oval to oblong, about 6 lines long, on a short leafy peduncle whose leaves equal or surpass the catkins, closely-flowered; scales mostly rose-colored but sometimes nearly black; pods short-woolly, sessile; styles slender; very variable in the leaves and catkins, evidently closely allied to *S. glauca*. A common form with us is 2-3 feet high, forming a low bush. Pubescence sometimes yellowish, but mostly white. Common in the mountains near timber line from Colorado and probably New Mexico to the East Humboldt Mts., Nevada and northward.

39. *S. candida* Fluegge, in Willd. Sp. Pl. 4 708 (1806). **The Hoary Willow**. (*candida*, hoary).

Leaves linear-oblanceolate, 3-5 inches long, remotely denticulate, revolute, acuminate below, loosely floccose-woolly above and densely so below, strongly reticulated below; stipules about as long as the short petioles; catkins coming out with the leaves, closely-flowered, short-linear, the fertile ones at length 2 inches long and loosely flowered; pods linear-lanceolate, short-stipitate, densely woolly, 2-3 lines long; styles filiform. A low bush growing around lakes and etc., rare southward, Colorado, Flathead Lake, Montana, and northward.

ABBBCCDD. Leaves obovate, broad; pods evidently stipitate.

40. *S. Drummondiana* Barratt in Hook. Fl. Bor. Am. 2 144 (1838) **Drummond's Willow**. (*Drummondiana*, Drummond's).

Leaves entire, about 2 inches long, attenuate toward the base, smooth above and densely white-woolly below; rigid, midrib yellow, petioles long; stipules lanceolate, small, glaucous below; catkins coming out before the leaves, sessile, 2 inches long, linear; scales obtusish; pods 1 line long, conical, thinly silky-woolly to smooth; styles elongated; a shrub with shining, strict, yellow branches. Selkirk Mts., British America.

ABBBCCC. *Slender shrubs or trees 10 feet or more high, not alpine nor subalpine.*

ABBBCCGD. *Leaves a trifle wider above, not linear, paler below, sparsely pubescent, variably silky when young; catkins coming out with the leaves and leafy-bracted; pods acuminate and long-stipitate; styles short; fertile scales narrow; plants of the Middle Temperate Life Zone.*

ABBBCCDE. *Leaves acute, mostly obtuse at base, slender petioled; catkins narrow and longer than the bracts.*

41. S. rostrata Rick. Frank Jour. App. 753. (1853). **The Beaked Willow.** (rostrata, beaked). *S. Bebbiana* Sargent.

Leaves narrowly to oblong-elliptical, a trifle wider above, acute to shortly acuminate, thin and entire when young, 1-3 inches long, pale; pods about 3-4 lines long, soft and delicate, subulate from an ovate base, puberulent to silky, the filiform stipe fully 1 line long; male catkins coming out long before the leaves, 6-12 lines long, broadly linear, sessile, very densely flowered, yellow, with a few small bracts at base; fertile scales narrowly oblong, nearly smooth, yellow; pistillate catkins coming out with the leaves; when young oval to linear, evidently peduncled and with large, leafy bracts, at length 1-3 inches long and broadly linear and loosely many-flowered; twigs reddish, slender and widely-spreading; stems tufted, flexuous, light-gray with yellowish under-coat, 8-20 feet high, wood with reddish center. This willow with *S. Scouleriana* and *cordata* is one of the most common willows along creeks in the mountains in the Middle Temperate Life Zone from New Mexico to the San Francisco Mts., Arizona and the Sierras of California and northward.

42. S. petiolaris Smith, Trans. Linn. Soc. 6 122 (1802) **The Slender Willow** (petiolaris, petioled).

Leaves narrowly oblanceolate with a more or less acuminate apex, sharply serrulate, 2-4 inches long, glaucous below; catkins linear to ovoid, nearly sessile, with few short and leafy bracts, densely-flowered, 1-2 inches long; scales black-tipped, yellowish below; pods 2 lines long, triangular-ovate, silky to puberulent; stipe in the type shorter than the scale; scales obovate, silky; a shrub 3-10 feet high. Edmonton Alberta to the Saskatchewan and eastward.

S. petiolaris var. *gracilis* And. Sal. Am. and DC. Prod. 16 2 235 (1868). **The Slender Variety.** (*gracilis*, slender).

Fertile catkins very slender and sparsely flowered; scales narrow; pods long-beaked from an ovate base, long-pedicelled; leaves linear-oblanceolate. This grows on the Saskatchewan.

ABBBCCDEE. *Leaves narrowly oblanceolate and acute at both ends, very short-petioled, entire, 1-2 inches long; fertile catkins, oval or broadly oblong, barely surpassing the bracts, 6-9 lines long, almost sessile.*

43. *S. macrocarpa* Nutt. Sylva 1 67 (1842). **Columbia Willow.** (*macrocarpa*, thick-podded, an unfortunate and misleading name), *S. Geyeriana* And.

Leaves brownish-silky, soon green above, glaucous below; scales of the sterile catkins obovate, black, and rounded; scales of the fertile catkins narrow and light-colored; pods ovate-lanceolate, barely 2 lines long, villous to nearly smooth; stipe as long as the scale or more. This is said to be a small shrub growing in ponds in the Columbia Basin. It is considered as a good species by some but is almost certainly a depauperate variety of *S. rostrata* with shorter and less acuminate pods, and appears like a hybrid between that and *S. glaucops*. Bebb has described a var. *argentea* (Bot. Gaz. 10 223 1885) with silky pods and silvery-silky leaves. Intergrading material is found in the Blue Mts. Oregon, and the eastern side of the Sierras in Modoc Co., California. The form reported from Colorado by Bebb is undoubtedly *S. rostrata*, which occasionally has obovate and rounded black staminate scales, but otherwise is normal *S. rostrata*. The species is occasionally monœcious. Rare.

ABBBCCCCDD. Leaves linear or nearly so; fertile catkins coming out after the leaves on leafy branches; scales from linear-lanceolate to broadly-oblongate, but narrow and long (rhomboidal in *taxifolia*), yellowish, smoothish toward the tip; plants of the Tropical and Lower Temperate Life Zones.

44. *S. longifolia* Muhl. Neue Schrift. Ges. Nat. Fr. Berlin 4 238 t 6 f 6 (1803). **The Long-leaved Willow.** (*longifolia*, long-leaved), *S. fluviatilis* Nutt.

Leaves linear to oblanceolate, acuminate and also tapering at base, nearly sessile, 1-4 inches long; pods narrowly ovate to lanceolate; tufted shrubs or small trees with straight arrow-like branches, growing along streams. The most polymorphous willow which Rowlee has separated into many untenable species, for they intergrade in all directions. The leading forms are:

S. longifolia var. *exigua* (Nuttall Sylva 1 75 (1842) as species). **Desert Willow.** (*exigua*, small or starved), *S. Nevadensis* Watson, *S. stenophylla* Ryberg.

Leaves linear, entire; pods smooth and sessile. A small shrub common in the deserts from the Plains westward.

S. longifolia var. *argophylla* (Nuttall) And.; Nuttall Sylva 1 71 t 20 (1842) as species; And. DC. Prod. 16 2 214 (1868). misprinted as *argyrophylla*. **Silver-leaved Desert Willow.** (*argophylla*, silver-leaved).

Leaves and sessile pods silvery-silky all over; leaves mostly linear, more common at the upper edge of the lower Temperate Life Zone to Montana and Oregon and southward. At high elevations the twigs are red, but in warmer situations they are more yellow.

S. longifolia var. *pedicellata* And. Mon. Sal. 55 (1867). **The Pediceled Desert Willow.** (*pedicellata*, pediceled).

Pods with a conspicuous pedicel often longer than the scale, smooth, leaves nearly linear and remotely denticulate, sometimes smooth. Rare. Same range as the above.

S. longifolia var. *sessilifolia* (Nuttall Sylva 1 84 (1842) as species). **California Desert Willow.** (*sessilifolia*, sessile-leaved).

This is a small tree appearing quite different from typical *S. longifolia*, chiefly distinguished by the large oblanceolate and denticulate leaves, pubescent pods, short style, linear stigmas, and smooth scales, but none of these characters hold. Common throughout California, even in the Tropical belt.

S. longifolia* var. *interior (Rowlee. Torr. Bull 27 253 (1900) as species). **The Southern Desert Willow.** (interior, belonging to the interior).

Pods smooth or sparingly pubescent; catkins loosely flowered; leaves narrow. This is a common form of the interior plains to Colorado.

45. *S. taxifolia* HBK. Nov. Gen. & Sp. 2 22 (1817). **The Yew-leaved Willow.** (*taxifolia*, yew-leaved).

Leaves linear, entire, shortly acute at both ends, about 1 inch long, softly-pubescent as well as the twigs, many; catkins on very long branches, 8 lines or less long, oblong to nearly globular, short-peduncled, seldom over 10-flowered and rather dense; pods oblong-ovate, broad, obtuse, about 1 line long, nearly sessile, from smooth to densely silky, with short and thick style and long and divaricate stigmas; scales rhomboidal to obovate, acute, inclined to clasp the pods; a much branched bush 3-10 feet high. Southern Arizona and southward in the Lower Temperate Life Zone.

AA. Stamen 1; anthers black; scales reddish with rather dark tip.

46. *S. pellita* And. Mon. Sal. 139 (1867). **The Shining Willow.** (*pellita*, covered with a skin, referring to the shining skin-like under surface of the leaves), *S. Sitchensis* var. *angustifolia* Bebb.

Leaves oblong-oblanceolate-cuneate, 1-3 inches long, 3-6 lines wide, entire, revolute, acute, puberulent and dark above, satiny shining below, and white or yellowish; catkins linear, densely flowered, 1-2 inches long, on leafy peduncles coming out with the leaves, staminate flowers not known; pods broadly ovate, about 1 line long, satiny, on a stipe about as long as the short elliptical and acutish scale which is sparsely short-hairy; styles filiform with short stigmas; twigs reddish and nearly black, smooth; low subalpine shrubs a few feet high. Stein's mountain, eastern Oregon to the Sierras of California at Summit and northward. This is supposed to have but one stamen as it corresponds so closely with *S. Sitchensis* in all other respects except the narrower leaves, and is probably only a variety of it, though *Sitchensis* grows only along the coast in a very different Life Zone.

*AAA. Stamens 5 mostly (3 or more); scales yellow, very thin, mostly smooth toward the end, not darker above; all catkins coming out with the leaves and leafy-bracted; staminate catkins linear and long (broader in *S. lasiandra*); pods smooth and stipitate, trees or tall shrubs with bark rough below, mostly growing in the Lower Temperate and Tropical Life Zones, none alpine or subalpine.*

AAAB. Petioles not glandular nor viscos; catkins long-peduncled,

AAABC. Leaves thin; linear to linear-lanceolate and tapering from near the base to a long acumination; petioles 2-4 lines long.

47. *S. nigra* Marsh. Arb. Am. 139 (1785). **The Black Willow.** (*nigra*, black).

Petioles smooth; leaves smooth and green on both sides but lighter below, several inches long, finely serrulate; scales deciduous, mostly entire; twigs slender; a widely branching large tree, with rough and ridged gray lower bark, and white wood, growing in moist soil, mostly near streams in the lowlands. The common form in collections has the early twigs with linear-oblong and shortly acuminate leaves on the twigs which bear catkins, and thus approaching *S. amygdaloides* in the leaves. Common in the three Life Zones from British America southward.

S. nigra var. **Wrightii** And. Mon. Sal. 22 (1867); and Vet. Ak. Forh. 15 115 (1858). **Wright's Willow.** (*Wrightii*, Wright's), *S. occidentalis* Koch.

Pods long-stipitate with the stipe nearly as long as the pod; leaves very long and narrow, green to glaucous below. This is the common willow of the Tropical Life Zone of New Mexico and Arizona and southward.

48. S. Humboldtiana Willd. Sp. Pl. 4. 657 (1805).

Humboldt's Willow. (*Humboldtiana*, Humboldt's).

This willow has short internodes and linear and very long (4-5 inches) and tapering leaves green on both sides, and very slender twigs, and may occur in Southern Arizona since it is common in Mexico.

AAABCC. Leaves narrowly elliptical to oblong-lanceolate, variably glaucous below, rather shortly acuminate; pods ovate, about 1 line long.

49. S. amygdaloides And. Vet. Akad. Forh. 114 (1858). **The Peach-leaved Willow, and The Black Willow.** (*amygdaloides*, like the peach).

Leaves thin, smooth on both sides, as well as the 6-9 line-long petiole, often paler below, narrowly elliptical and shortly acuminate, mostly; catkins denser; otherwise the same as in *S. nigra* from which it is hardly distinct. This is more common northward though occurring throughout our region.

50. S. laevigata Bebb. Bot. Cal. 2 83 (1880). **The Smooth Willow.** (*laevigata*, smooth, referring to the glossy upper side of the leaves).

Leaves leathery, mostly simply acute, the earliest obovate and only mucronate, dark-green and glossy above when mature (often silky when young), paler or glaucous below, minutely serrulate; petioles downy and short; scales denticulate; pods broadly ovate, not long-stipitate; a large shrub or small tree generally with several trunks together. This abounds in the lowlands of western California, but may occur along the eastern base of the Sierras southward.

AAABCCC. Leaves linear-elliptical, shortly acuminate, remotely denticulate, on short, stout, woolly petioles, very glaucous below.

51. S. Bonplandiana HBK. Nov. Gen. & Sp. 2 24 t 101, 102 (1817). **Bonpland's Willow.** (*Bonplandiana*, Bonpland's).

Leaves leathery, upper side dark and glossy, margin revolute, 3-6 inches long; catkins nearly sessile, many flowered and dense; pods conical and nearly sessile. Fair-sized trees with long and slender

branches, growing near water holes in the lower Temperate Life Zone from the Catalina mountains of Arizona and southward.

AAABB. Petioles glandular or viscous and often with raised glands near the top; tufted and erect shrubs 10-20 feet high; catkins thick; growing in the Middle Temperate Life Zone along streams.

52. *S. lucida* Muhl. Neue Schrift. Ges. Nat. Fr. Berlin 4 239 t 6 f 7 (1803). **The Glossy Willow.** (*lucida*, shining).

Leaves from ovate to lanceolate and acuminate, rather rounded at base, sharply serrulate, smooth, green and glossy on both sides or sparingly hairy when young; petioles with conspicuous glands at the top, stout, 3-6 lines long; catkins short-peduncled. This grows along the eastern base of the Rocky Mountains of British America and eastward.

53. *S. lasiandra* Benth. Pl. Hartw. 335 (1857). **Waxy Willow.** (*lasiandra*, with hairy stamens).

Leaves linear-lanceolate to oblong lanceolate, mostly shortly acute at base and acuminate at tip, very closely and finely serrulate, rather leathery, very bright green, as if waxy, at least above, 3-6 inches long, smooth, growing in swabs at the ends of the twigs, the petioles and twigs appearing waxy or glutinous and variably short-woolly; stipules semi-lunar, glandular-dentate and mostly large; catkins very thick and dense, 1-3 inches long, linear-oblong to linear, very yellow, long-peduncled and leaves of peduncle often as long as the catkins and mostly oblong-linear and shortly acuminate; scales dentate, large, rather smooth above; styles short; pods ovate with a short-triangular beak, 2 lines long, about twice the filiform and smooth stipes; large shrubs with long and strict branches and smooth gray bark except at the very base. The typical form has narrow leaves, glaucous below; small stipules; scales evidently dentate; first year's twigs yellow, and second year reddish. This grows in the Middle Temperate Life Zone and frequents both sides of the Sierras from California to Oregon.

***S. lasiandra* var. *lancifolia* (And.) Bebb., And. Mon. Sal. 34. f 23 (1867), as species; Bebb. Bot. Cal. 2 84 (1880). The Lance-leaved variety.** (*lancifolia*, lance-leaved).

Leaves tapering from near the base to a long and often falcate acumination, green on both sides; scales of fertile catkins often linear, those of the sterile catkins dentate and wider, but variable. From the Sierras of California to Mt. Ibapah, western Utah and northward.

***S. lasiandra* var. *Fendleriana* (And.) Bebb., And. Sal. Bor. Am. 115 (1858) as species; Bebb. Bot. Cal. 2 84 (1880). Fendler's Variety.** (*Fendleriana*, Fendler's), *S. lasiandra* var. *caudata* (Nutt.) Sudworth.

Leaves oblong-lanceolate with a short acumination, green on both sides. It reaches 20 feet high, but usually is 10-15 feet high, with a trunk often 4 inches in diameter, always growing in dense tufts with flexuous gray stems with rather thick and long lemon-yellow season's twigs. It is the most beautiful of the willows of the Great Plateau, and is the common form from the Sierras of California eastward to New Mexico and northward in the mountain canyons.

POPULUS L Syst., Gen. 307, Sp. Pl. 1034.

POPLAR, ASPEN, COTTONWOOD.

Catkins coming out before the leaves, axillary and sessile or nearly so, the female elongating and slender; pendulous; bracts deciduous, lacerate, broad; stamens many on the face of a broad and truncate disk; ovary with a cup-shaped disk below; pods oblong-ovate to orbicular $1\frac{1}{2}$ -5 lines long; buds scaly and mostly resinous; stipules deciduous; leaves broad except in some forms of *P. angustifolia*. Trees with soft, brittle, and white wood, bitter bark; quick growers, thriving in moist places only, and mostly at low elevations. A genus of about 25 species. The green bark a bitter tonic, good for fevers, etc.

Key to Species.

- A. Buds glutinous and large or long; bracts smooth or nearly so; male catkins red.
 - AB. Serratures fine and small, many.
 - ABC. Petioles not evidently flattened.
 - ABCD. Pods and ovaries smooth.
 - Leaves linear-lanceolate to ovate, base cuneate and tip acuminate; twigs slender.
 - 1. *P. angustifolia*.
 - Leaves ovate, mostly with a cordate base; twigs thick; upper stems and branches white.
 - 2. *P. balsamifera*.
 - ABCDD. Ovaries evidently hairy; twigs thick; upper stems and branches white; leaves glaucous below.
 - 3. *P. trichocarpa*.
 - ABCC. Petioles evidently flattened; leaves mostly as wide as long or wider.
 - Leaves mostly rhomboidal with a truncate to cuneate base and acuminate tip; cultivated trees.
 - 4. *P. nigra*.
 - Leaves from nearly orbicular to reniform, base truncate to cordate, tip short and sharp.
 - 5. *P. deltoides*.
 - ABB. Serratures large and few, mostly 7-10 on a side.
 - 6. *P. Fremonti*.
- AA. Buds not glutinous, small; bracts white-hairy.
 - Leaves smooth, finely if at all serrulate, nearly entire.
 - 7. *P. tremuloides*.
 - Leaves silvery-white-hairy below, very coarsely dentate.
 - 8. *P. alba*.

A. Buds large, or long and glutinous; bracts smooth or nearly so; male catkins red; roots inclined to produce suckers; trees in the natural state having innumerable branches a few feet above the ground (usually where the first large branches start) forming a dense mass.

AB. Serratures many, fine and nearly always small.

ABC. Petioles rounded or flattened only at very tip; styles 2-3; pods nearly sessile; leaves longer than wide, waxy above; plants of cool climates of the Middle Temperate or Upper Temperate Life Zones, found only in the mountains below Lat. 42 deg., and native only in high valleys and mountains above it; trees balloon-shaped in outline.

ABCD. Pods and ovaries smooth, the former short-pedicel.

1. *P. angustifolia* James Long's Exp. 1 497 (1823). The Long-leaved Cottonwood. Black Cottonwood. (*angustifolia*, narrow-leaved).

Leaves normally narrowly lanceolate and acuminate from a cuneate base and closely serrulate, 2-4 inches long and on a short petiole about 6 lines long, and yellowish-green on both sides, willow-like, but often, especially at low elevations, the leaves vary on the same tree to rhomboidal ovate with a truncate base, and the petioles vary to 2 inches long, and the under side of the leaves is often a little glaucous, the serratures vary from evident crenulations 1-2 lines high to very minute and more numerous, often absent at tip and base. The plant can usually be separated from its congeners by the slender twigs, narrow, nearly linear and acuminate buds, great variability of leaves on the same tree, and by the larger branches being little glaucous, and as the tree gets old, by the large branches dying one by one giving it an unsightly appearance. When the leaves are triangular-ovate on long petioles and without serratures at each end then it is *P. acuminata* Rydberg, a very inappropriate name, but only isolated trees are like this, while there are all sorts of intergrades. The pods are oval to ovate, 2 lines long, barely acute, cross-section round with no ridges nor angles when fresh, pedicels 1 line long and slender, torus 1 line wide; racemes 3 inches long; bark on the upper limbs brownish-green, and without bloom, the cambium layer turns black soon after being cut across; bark on the main trunk and larger branches often 2 inches thick, soft, cracked into sharp ridges which are regular and long and composed of many thin laminations which do not flake off; wood white to the core, of soft fibers surrounding the innumerable pores, annual rings broad; last season's twigs slender, chestnut-colored, becoming lighter in spring and shining, and at length gray; a rapid grower, maturing in about 25 years and becoming scraggly after that. A tree generally about 50 feet high, with few straight branches coming out at acute angles and again branched; much planted for ornament but soon becoming unsightly and wormy. It is probably the worst shade tree planted, the Lombardy coming next. Very common from the Plains to the Sierras and northward, local only in the high mountains of Arizona and New Mexico along streams, but coming down into the valleys of central Utah and northward, though also growing up to 8,000 feet alt. in the mountains. It is much used for fuel, posts and poles, but soon

rots, seldom used for lumber as the trees rarely reach 2 feet in diameter.

2. *P. balsamifera* L. 1034. **Balm of Gilead.** (*balsamifera*, *balsam-bearing*).

Leaves ovate from a truncate to cordate base, dark green above and more or less glaucous below, slender-petioled; twigs stout, the last season's mostly chestnut-colored, with very large, acute and very resinous buds; pods 3 lines long, deeply 2-3-grooved. A very large and magnificent tree, often 100 feet high, with great ringed branches, spreading at an acute angle which are white and glaucous almost throughout, and much branched but not into the many slender twigs of the above, rather long-lived, and trunk sometimes 6 feet in diameter. The variety *candicans* (Ait.) Gray, Aiton Hort. Kew. 3 406 (1789) as species; Gray Man. Ed. 2 419 (1856) has cordate leaves, pubescent petioles and silvery-white under side of leaves, but hardly deserves varietal rank. This tree abounds from Newfoundland to New Jersey, and westward through northern Colorado to Idaho, and north-westward and northward to Alaska. It replaces the cottonwood in the cold valleys. It is planted for shade in Utah and western Nevada, though not native there, and is everywhere so used throughout Montana and Idaho. It is much used for fuel, poles, fences, etc. The wood is about the same as the above.

ABCCD. Pods hairy when young; styles 3.

3. *P. trichocarpa* Torr. & Gray in Hooker's *Icones* 9 t 878 (1850) **Cottonwood.** (*trichocarpa*, hairy-pod).

Leaves from ovate with a truncate to cordate base to broadly lanceolate, acuminate, much lighter below, inclined to yellowish on the veins below; otherwise as in *P. balsamifera* of which it is hardly more than a variety. Common in the Sierras and adjacent ranges of western Nevada and northward along streams and much planted for shade in Utah, etc.

ABCC. Petioles evidently flattened; leaves mostly as wide as long or wider; pods on short pedicels; plants of the Middle to Lower Temperate Life Zones.

4. *P. nigra* L. 1034. **Lombardy Poplar. Black Poplar.** (*nigra*, black).

Plants introduced from Europe, the staminate ones narrow and spire-like, the pistillate ones with widely-spreading branches for the most part. Leaves mostly rhomboidal with a truncate to cuneate base and acuminate tip; pods oblong, obtuse; twigs round. The staminate form called variety *dilatata* is much planted for ornament throughout the Great Basin, because it is so conspicuous. It forms a good wind-break, but soon dies, limb by limb, and becomes unsightly and is much prone to the production of suckers from the roots. The typical form is cultivated at Salt Lake City.

5. *P. deltoides* Marsh. *Arb. Am.* 106 (1785). **Cottonwood.** (*deltoides*, deltoid). *P. monilifera* Aiton and *P. angulata* Aiton.

Trees in outline nearly hemispherical, often 100 feet high and 6 feet thick at base, with nearly horizontal and long lower branches, all branches light-green above and the larger ones with rough bark

below as well as on the main trunk; twigs inclined to be angled, slender, often drooping; leaves broadly deltoid, oblate or almost reniform, rarely at all cordate, but with truncate to broadly cuneate base, abruptly acuminate, often very large, rather light-green, on a petiole about as long as the blade; bark cracked much as in *P. angustifolia*, but the ridges flat on the top and warty; pods ovate, acute, 4-5 lines long, longer than the pedicels; scales less fimbriate than in the next. This is the finest tree of the genus, makes an admirable shade tree, is long-lived, and does not die limb by limb, it is a very rapid grower. Cultivated in Salt Lake City, etc. Native along streams on the plains of Wyoming to Texas and sparingly through Arizona to the southern Sierras. Rare west of the Plains.

ABB. Serratures large and few, mostly 7 on a side, forming scallops.

6. *P. Fremonti* Watson Proc. Am. Acad. 10 348 (1875). *Fremont's Cottonwood.* (*Fremonti*, *Fremont's*).

Trees doubtfully distinct from and with the habit of *P. deltoides*, and with the light-green branches and smooth pods, long petioles and wide leaves of that species; it differs from it in the few and large teeth, smaller mostly reniform or cordate leaves, broad torus or disk often 3-4 lines wide. The last season's twigs are shining, not angled, yellowish or chestnut-tinged; the smaller branches are often 6 feet long and drooping; pods ovate, 4-5 lines long, round when fresh, on pedicels 2-3 lines long in the type, in long racemes; scales fimbriate with long threads; the serratures on the upper leaves are often more numerous and even on the lower ones in the type, but usually are few and large, in the type they are more numerous and often 2 lines high and sharp and narrow; edges of the leaves with cartilaginous and sharp and ciliate margins; buds ovate-lanceolate, acute, large. Very common in the valleys of Central California, rare in the interior to Colorado on the plains.

P. Fremonti var. *Wislizeni* Watson Torrey Bull. 9 79 (1882). (*Wislizeni*, *Wislizenus's*).

Pedicels 6-8 lines long; leaves with few and broad scallops. This abounds throughout the Lower Temperate and Tropical Life Zones from middle Colorado on the Plains through northern Utah to the Sierras in southern Oregon and southward to Mexico. It is everywhere cultivated for shade, is a rapid grower, a magnificent tree and long-lived; it grows along streams, at springs and in moist places only; like the above it is much used for fuel, poles, posts, arbors, etc. Much complaint is made against the cottonwoods because of the cotton from the female trees, but this can be obviated by watching the trees in the spring and selecting cuttings only from those that produce red pussies or catkins, which are male and produce no cotton.

AA. Buds not glutinous, small; bracts white-hairy.

7. *P. tremuloides* Michaux Fl. Bor. Am. 2 243 (1803). *Aspen. Poplar. Quaking Asp.* (*tremuloides*, like *tremula*).

Erect trees, with main trunk not branching and strong terminal buds and short and small lateral branches which are nearly horizontal and soon dying below and dropping off; trunk mostly white and warty

to the base, occasionally roughened at base and with cracked bark; outline of tree narrow; leaves nearly round, 2-6 inches wide, green, smooth, leathery like the rest of the species, on a much flattened petiole, constantly in motion; buds black; tips of twigs in spring dark chestnut-brown; catkins dark and fuzzy; pods 1½-2 lines long; styles 2; scales deeply cleft. The straight stems are much used for poles, lagging, fences and fuel. It abounds in the mountains in all situations in the Upper Temperate Life Zone from Mexico northward, and in Idaho and Montana in the cold valleys, forming large patches, and even forests, and is the foster mother of the evergreens filling all open spaces and shading the young conifers till they shoot up above it. It is a short-lived tree, rarely reaching 2 feet in diameter, and usually about 6 inches thick, forming dense thickets of white poles.

8. *P. alba* L. 1034. **Silver-leaved Poplar.** (*alba*, white).

Cultivated trees with rounded outline and widely-spreading branches, which are white and repeatedly forked, much after the style of *P. trichocarpa*, but more branched; leaves silvery-haired below, dark-green above, and somewhat hairy, coarsely and remotely dentate or almost lobed, ovate, rather large; petioles not flattened, woolly bracts shortly toothed; buds ovate. A long-lived tree with large trunk and very vigorous growth, spreading much by suckers from the roots. Salt Lake City, etc.

